Missouriensis

Volume 28/29 (2008)

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IMPROVED STATUS OF AURICULATE FALSE FOXGLOVE (*AGALINIS AURICULATA*) IN MISSOURI IN 2007

Tim E. Smith
Missouri Department of Conservation
P.O. Box 180, Jefferson City, MO 65102-0180

Tom Nagel
Missouri Department of Conservation
701 James McCarthy Drive
St. Joseph, MO 64507-2194

Bruce Schuette
Missouri Department of Natural Resources
Cuivre River State Park
678 State Rt. 147
Troy, MO 63379

Populations of annual plant species are known to have periodic "boom" and "bust" years as well as years when plant numbers more closely approach long-term averages. In tracking populations of plant species of conservation concern (Missouri Natural Heritage Program, 2007), there are sometimes also boom years in the number of reports of new populations. Because of reports of five new populations and a surge in numbers of plants at some previously-known sites, 2007 provided encouraging news for the conservation of the auriculate false foxglove [*Agalinis auriculata* (Michx.) Blake] in Missouri.

The 2007 "boom" of auriculate false foxglove in Missouri is especially significant because of the overall rarity of the species. Although known, at least historically, from 22 states, Missouri has more populations (44) than any other state, with Illinois a close second with 41 sites. In five states it is thought to be extirpated or known only from historical collections, twelve states list it as S1 (critically imperiled), four states list it as S2 (imperiled) and Missouri now lists it at S3 (vulnerable) (NatureServe 2007).

Prior to 2007, the auriculate false foxglove was known from Ozark County only from an October 1927 fruiting collection by

E.J. Palmer at "Bald Jess," a dolomite bald knob about 4.5 miles west/northwest of Gainesville. On July 25, 2007, a specimen was collected from Long Bald Natural Area within Caney Mountain Conservation Area by a Missouri Department of Conservation (MDC) plant monitoring crew composed of Merrit Hoeh, Leta Hightower, and Lauren Redmore. The crew were having lunch in the shade of a rare cedar tree on the gladey ridge when they noticed the sterile stem of a plant that they couldn't identify. Later examination of the sterile stem and return visits to the site confirmed an auriculate false foxglove population of about 200 stems. This site is about six miles north/northwest of Gainesville. The nearest extant Missouri population is in Cedar County, although historical collections exist from Shannon (1893) and Jasper Counties (1924 and 1925), as well as from the historical Ozark County site described above.

Auriculate false foxglove is known from several locations in northwestern Missouri, with extant populations known from Jackson, Ray, DeKalb, Nodaway and Harrision counties. New sites for the species in 2007 included:

A population of seventeen flowering stems discovered by Tom Nagel (MDC) at a degraded cemetery prairie in northern Harrison County.

A population of at least 500 stems on a tract owned by The Nature Conservancy (TNC) in northern Harrison County. This population was discovered by Randy Arndt, Doug Ladd, and Blane Heumann (all TNC staff). The site had a recent history of farming, enrollment in the Conservation Reserve Program, and then a series of prescribed fires.

A population of about 75 stems found by Randy Arndt and Dennis Perkins (TNC) on TNC's Pawnee Prairie in Harrison County.

In addition to new sites in northwestern Missouri, a survey of a known population at the Pony Express Conservation Area (DeKalb County) by Tom Nagel, Dennis Browning, and LuAnn Cadden (all MDC) resulted in an expansion of a known site. They found 80 stems growing in an area adjacent to the previously documented site, which contained 165 stems.

In the Osage Plains Region, auriculate false foxglove was observed in 2007 at Taberville Prairie Conservation Area, a site known since 1989. It was also first reported from Wah-Kon-Tah Prairie, although plants had apparently been observed there previously. Part of that population is in an area that has been under a patch-burn-graze management.

A new site was located in central Missouri by Missouri Native Plant Society Hawthorn Chapter member Ann Wakeman. Plants were found in a five-acre prairie restoration area that had recent cedar removal and prescribed fire. Other chapter members, Jim Whitley and Becky Erickson, followed up to photographically document the site, which held eight plants. The occurrence is the first report from Boone County and from the central Missouri region, the closest previously-known sites being in Macon and Shelby counties.

In northeastern Missouri, a significant increase in plants was documented in 2007 at previously known sites within Cuivre River State Park, Lincoln County. The highest number of plants reported in previous years had been about 3,800 stems total from two prairie areas. The 2007 counts were 575 stems at one site and an estimated nearly 7,000 stems at the other.

The Cuivre River sites have been known since 1986, and monitored periodically since 1995. There appears to be a strong correlation between prescribed burns and the number of *Agalinis auriculat*a stems, although data is available for only two non-burn years (Fig. 1).

The other population in the park is smaller, but once again the lowest number counted was in a non-burn year and the highest two counts were in burn years, with 575 stems in 2007 being the highest count yet.

The authors do not put forward any theories to explain the increase in auriculate false foxglove plants in 2007. Because the species seems to benefit from soil disturbance and prescribed fire, the recent management at a given site may explain why a particular population has responded. But that does not explain why multiple new populations were located in a single year. The Missouri status

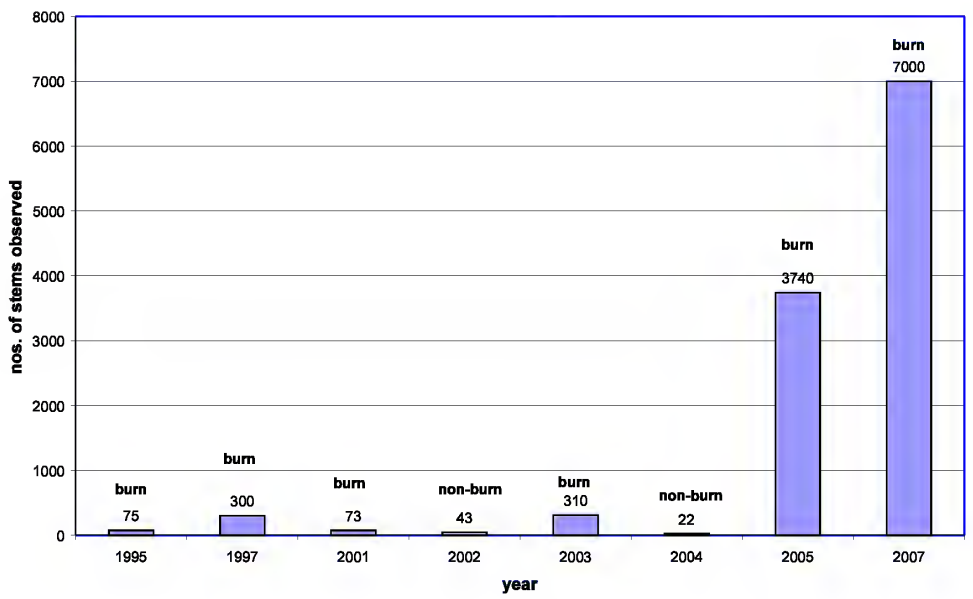

Figure 1. *Agalinis auriculata* at Cuivre Rivre State Park, Lincoln County, Missouri. Number of stems per year observed at the Dry Branch Site. Note indication of burn vs. non-burn years for the site.

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the species was changed from S2 (imperiled) to S3 (vulnerable), based on the current number of known locations. Continued monitoring of known sites should help us to determine if the 2007 results are part of a long-term upward trend for the species.

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CURRENT STATUS OF YELLOW FALSE MALLOW (*MALVASTRUM HISPIDUM*) IN MISSOURI

Tim E. Smith
Missouri Department of Conservation
P.O. Box 180, Jefferson City, MO 65102-0180

An effort was made during the 2007 field season to collect more current information on the Missouri status of yellow false mallow, *Malvastrum hispidum* (Pursh) Hochr. (Malvaceae). The species formerly was called *Sphaeralcea angusta* (A. Gray) Fernald and is found under that name in the *Flora of Missouri* (Steyermark, 1963). Other common names include hispid false mallow and globe mallow.

Yellow false mallow is an alternate-leaved annual herb that blooms in mid- to late summer (July through September) primarily on limestone and dolomite glades and rocky areas of prairies. It is also reported from sandstone glades, bluffs, alluvial ground in valleys, and even gravel bars (Steyermark, 1963). It ranges in height from less than 15 cm to more than 60 cm with most plants around 35 cm tall. Leaves are oblong to lanceolate, rounded at the base and marginally serrate. Stems are hispid and may be yellowish green or reddish purple. The yellowish orange petals frequently do not protrude beyond the closed calyx. The five-parted, papery calyces enlarge during fruit development, reaching a diameter of about 1 cm, eventually turning from green to yellowish green (sometimes purplish-tinged) to dark brown as they mature. The distinctive calyces are the most useful character for identification, bearing five prominent ridges where the sepals meet at their edges (Fig. 1). According to Paul McKenzie (personal communication, 2007) the fruits bear a striking resemblance to his mother's apple dumplings, a perhaps less useful character for anyone else.

According to the U. S. Department of Agriculture Natural Resources Conservation Service's (2007) online Plants Database, *M. hispidum* is known from 52 Missouri counties as well as from nine other states, seven of which are adjacent to Missouri. The Missouri rank for the species is S3 (vulnerable) and the global rank is G3G5. In other states where a rank has been assigned, the

species is ranked as follows: Iowa — SH (possibly extirpated), Illinois and Virginia — S1 (critically imperiled), Kentucky — S2? (imperiled?), Tennessee — S2S3 (imperiled or vulnerable), Kansas — S4 (apparently secure) (NatureServe, 2007; for Kansas, personal communication with Craig Freeman, 2007).

My interest in the Missouri status of the species was prompted by my review of records in the Flora of Missouri Project's specimen database (2007). That database contained 60 records for the species, of which only 7 were specimens collected in the last 25 years. Six records were from the 1800s, with the earliest being an 1839 collection by Ferdinand J. Lindheimer from St. Louis County: "at the upper steam mills, above St. Louis, barren places, baked calcareous soil." Other nineteenth century records were from Greene, Jackson, Taney, and Washington counties. Twentieth century collections accounted for the remaining records, with the most recent collections from Montgomery, Lincoln, Texas, and Boone counties.

A conservation assessment by the U.S. Department of Agriculture Forest Service (2003) stated that yellow false mallow occurs: "with the highest frequency in Missouri." I was concerned that if Missouri was the stronghold for the species and 88 percent of our records were over 25 years old, the species may have either declined or was being overlooked by current Missouri plant collectors. I later learned that Missouri may not have the most occurrences, as the plant is frequently found on rocky, limestone prairies in the northern Flint Hills and parts of the Osage Plains in Kansas (Craig Freeman, personal communication, 2007).

For the 2007 growing season, I distributed to field biologists around the state a one-page flyer describing yellow false mallow and its habitats. I asked for reports of any sightings and for collected specimens from sizeable populations. In early August, I visited a Boone County site where the species was collected in 1998 (our most recent collection). I wanted to see if the plant could still be found there and, if so, to acquire a search image for the species. That trip was successful and led to later visits in August and September to several historical collection areas and to other areas that I thought might have the plant. The results of my 2007 surveys and those done by other biologists are summarized below.

Boone County—Plants still present in early August on a privately-owned limestone glade where previously collected in 1998; heavy deer browse of stems evident.

Wright County—Plants still present in mid-August on a privately-owned dolomite glade near a historical collection site; many of the plants were not fertile, probably due to drought.

Callaway County—Danville Glades Conservation Area; historical collection site nearby; all three limestone glade sites visited had plants present in late August, including Danville Glades Natural Area.

Benton County—Plants found in mid-September on a limestone glade on mowed right-of-way of State Highway 7 and an adjacent glade; this site is near a historical collection site south of the community of Racket.

Benton County—Truman Lake State Park; a few plants found in mid-September beside Western Wall-flower Trail on limestone glade; this is a new site but in the vicinity of the historical Benton Co. site above.

Benton County—Plants found in mid-September on mowed right-of-way of County Highway UU and an adjacent limestone glade, south of Truman Lake State Park; this is also a new site in the vicinity of the other two Benton County sites discussed above.

Camden County—Plants found in mid-September on a dolomite glade beside Quarry Trail in Ha Ha Tonka State Park; this is the first documented record of the species from Camden County.

Barry County—Plants found on a dolomite glade in Butler Hollow Glades Natural Area by Justin Thomas in late September. This is the first documented record of the species for Barry County.

In addition to the sites listed above, I conducted unsuccessful searches on dolomite glades in Cooper, Camden, and Callaway counties.

The discovery of yellow false mallow at the sites above, some historical and some new, leads me to conclude that the species probably has not dramatically declined in Missouri. I failed to find it at only one historical site and that was due to a lack of access to private land, where the suitable habitat in the area occurred. I believe that yellow false mallow has been overlooked due to its inconspicuous appearance and its habit of flowering and fruiting late in the growing season. It is a plant that I personally would have easily overlooked if I had not sharpened my search image and made an effort to find extant occurrences. Although not occurring in some habitats that appear to be suitable, the species has maintained healthy populations for decades in several historical areas of occurrence. The discoveries of two new county records this year indicate the value of raising awareness of the species within the botanical community. We will continue to track the species' locations in the Missouri Natural Heritage Database and I expect to have further reports of occurrences in years to come.

ACKNOWLEDGMENTS

I would like to thank several people who assisted in better defining the status of yellow false mallow in 2007. They are: Tom Johnson, Paul McKenzie, Justin Thomas, Wayne Porath, John Oliver, Bruce Schuette, and several members of the Missouri Native Plant Society who helped search for the species at Ha Ha Tonka State Park.

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Figure 1. Close-up view of inflated calyces of *Malvastrum hispidum* in Camden County, Missouri, in mid-September, 2007. Photo by John Oliver.

HELIOTROPIUM EUROPAEUM (HELIOTROPIACEAE) NEW TO MISSOURI

Jay A. Raveill
Department of Biology and Earth Science
University of Central Missouri
Warrensburg, MO 64093

George Yatskievych
Missouri Botanical Garden
P.O. Box 299, St. Louis, MO 63166

The first documentation of European or common heliotrope, *Heliotropium europaeum* L., growing spontaneously in Missouri was a collection made on 21 July 2007. The collector was Jonathan Slade, an undergraduate student at the University of Central Missouri, who included the unidentified specimen in a collection made as a part of a course entitled Plant Identification. The specimen originated from Taney County, at Bull Shoals Biology Field Station, which is operated by Missouri State University and located about 12 miles southeast of Branson (T22N R20W S12). The habitat was described as "open disturbed area" but the collector had no memory of specifically where within the field station the specimen was collected.

The most noticeable feature of this species is the inflorescence, which is a helicoid cyme (often called a scorpioid cyme) composed of tiny white flowers. This inflorescence type is typical in the family Boraginaceae and its segregates. Steyermark (1963) treated the genus *Heliotropium* in a broadly defined Boraginaceae. In his key to species of *Heliotropium, H. europaeum* keys to *H. indicum* L., Indian heliotrope, due to its petiolate leaves. These two species can be distinguished by European heliotrope having narrower leaves, shorter and white rather than pale blue corollas, and the fruit surface that is warty rather than ribbed. A representation of *H. europaeum* is shown in Fig. 1.

The genus *Heliotropium* will not be found with the remainder of the genera traditionally treated in the Boraginaceae in *Steyer-*

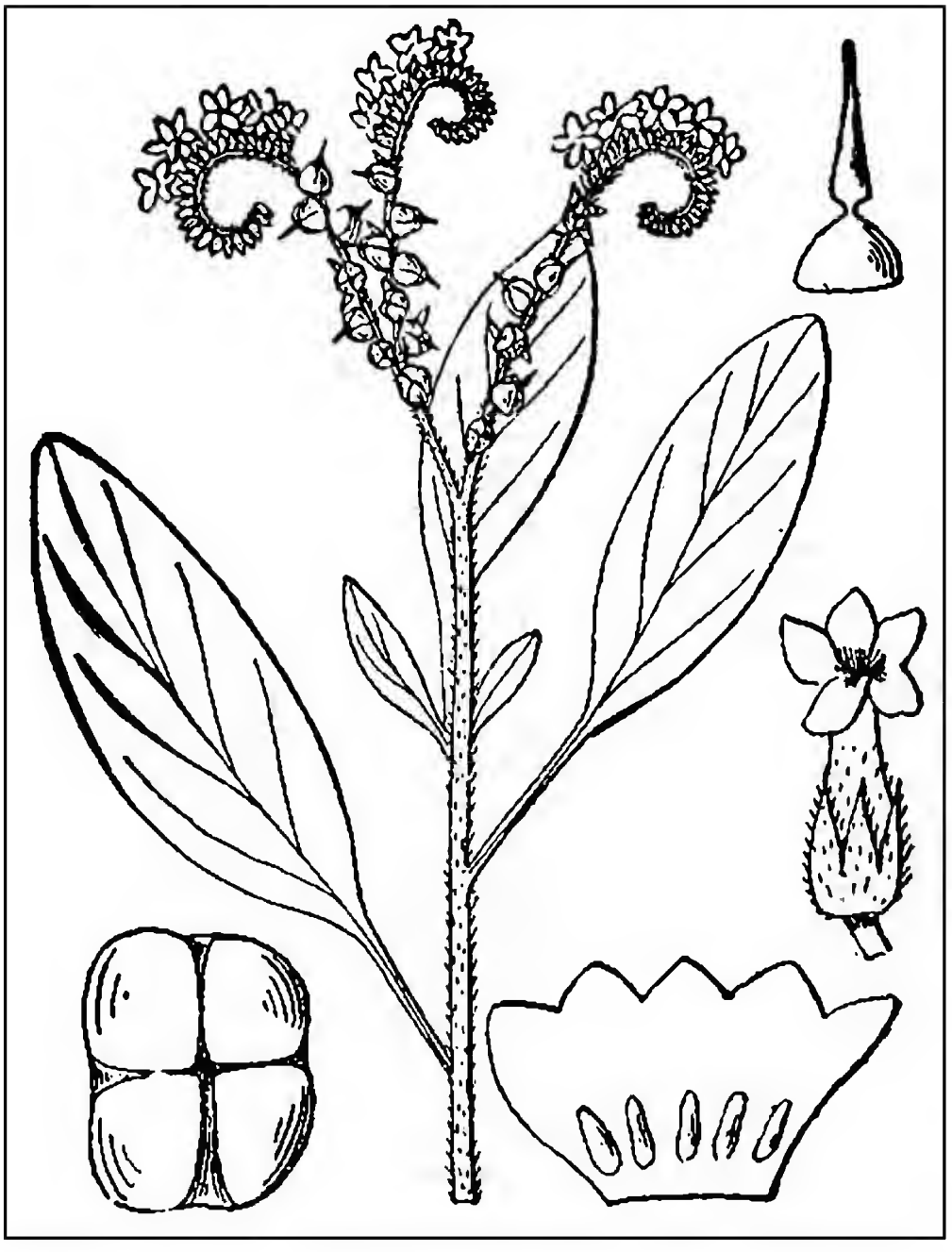

Figure 1. *Heliotropium europaeum*. Illustration from Britton and Brown (1913).

mark's Flora of Missouri (Yatskievych, 2006), because familial limits in the group have been revised in light of recent evidence. A primary goal of systematics is the reconstruction of the genealogy (evolutionary history displayed in a treelike branching pattern) of groups of organisms over evolutionary time. Traditionally, morpho-logical similarity was the primary consideration and relationships were understood only in a rather qualitative way. However, in the last quarter century, the comparison of DNA sequence variation has allowed for more rigorously derived hypotheses of evolutionary relationships. These more explicit hypotheses also emphasize that taxonomic untis, such as families and genera, represent a single phylogenetic lineage and that these named units contain all of the descendents of that lineage. Some traditional groups have survived the "molecular revolution" relatively intact, with DNA-based evidence supporting the previous morphological evidence, but major reorganization has been necessary in many groups. The family Boraginaceae is one example of a family that must now be redefined if it is to include all species that the best evidence available indicates have evolved within single lineages.

Sequence data from the chloroplast DNA gene (*ndhF*) indicates that the family Hydrophyllaceae (minus *Hydrolea* and a genus that does not occur in Missouri), are nested within a group that includes the Boraginaceae and some other non-Missouri groups often treated as separate families (Ferguson, 1999). Data from the nuclear ITS1 marker produced similar results, with the Hydrophyllaceae and five other groups forming a lineage with the Boraginaceae (Gottschling et al., 2001). However, the authors of these two studies reached different taxonomic conclusions. (Ferguson (1999) suggested that the entire group would best be treated as a single family under the name Boraginaceae, whereas Gottschling et al. (2001) suggested instead that the group should be split into a series of smaller, more morphologically cohesive, related families.

If one accepts the molecular data, then the circumscription of the family Boraginaceae, as traditionally treated, must be altered to accommodate the new evidence. One solution would be to expand the definition of the family to also include the members of the Hydrophyllaceae, Heliotropiaceae, and several other related (non-Missouri) groups (Angiosperm Phylogeny Group, 2003), with

some or all of the subgroups perhaps recognized taxonomically as subfamilies. The other solution would be to treat each of the distinct groups as a separate family (Diane, 2002; Gottschling, 2004; Hilger, 2003). The differing interpretations are fueled by a variety of factors, including the magnitude of the variation (both molecular and morphological) within the overall group, whether the phylogeny within the study group has any particular structure (are there two or more main subdivisions within the study set or do the subgroups fall out more or less individually and sequentially along the main axis of the phylogenetic tree), and practical considerations such as the relative ease of accommodating the group in a key to plant families of a region. Eventually, future studies should lead to a consensus within the botanical community as to the best taxonomic treatment, but but at the moment there are advocates of each of the two possibilities outlined above. In *Steyermark's Flora of Missouri*, Yatskievych (2006) chose the splitter's option, with the family Boraginaceae treated in a narrow sense and those segregates present in Missouri segregated into the Ehretiaceae, Heliotropiaceae, and Hydrophyllaceae. The genus *Heliotropium* thus will be treated in the Heliotropiaceae in the upcoming third volume of the series.

This species represents the fifth *Heliotropium* in the Missouri flora. Steyermark (1963) listed two species in the genus, the native glade species, *H. tenellum* (Nutt.) Torr., and the introduced, weedy, *H. indicum*. Two additional species have been recorded more recently from Missouri. Paul Nelson (1979) located the presumably native *H. curassavicum* L. at a salt spring in Cooper County. This widespread species, known as seaside heliotrope, is still known in Missouri only from a small number of saline sites in Cooper County.

The fourth species of *Heliotropium* in Missouri is a garden escape known as *H. amplexicaule* M. Vahl (clasping heliotrope). This species is known from a single specimen collected in 1899 by John H. Kellogg from a "waste area" in the city of St. Louis. The specimen was rediscovered in the Missouri Botanical Garden Herbarium by Yatskievych during his floristic research on the Boraginaceae and related families in Missouri. It has not been reported previously in the literature.

The five species of *Heliotropium* can be distinguished using the following key adapted from the draft key prepared for the third volume of *Steyermark's Flora of Missouri* (Yatskievych, in prep.):

1. Leaves 1–3 mm wide, linear; flowers solitary at the branch tips, noticeably stalked. . . . . *H. tenellum*
1. Leaves 3 mm wide or wider, not linear; flowers in scorpioid spikes (sometimes appearing as clusters when young), sessile
    2. Stems and leaves glabrous, somewhat succulent, usually glaucous. . . . . *H. curassavicum*
    2. Stems hairy, not succulent or glaucous
        3. Stems and inflorescences with gland-tipped hairs; leaves sessile; corolla tube with the inner surface densely hairy near the tip; nutlets appearing finely wrinkled on the dorsal surface. . . . . *H. amplexicaule*
        3. Stems lacking gland-tipped hairs; at least some leaves petiolate; corolla tube with the inner surface glabrous; nutlets with various sculpturing
            4. Leaf blades elliptic to oblong-elliptic or oblanceolate, the margins usually entire; corollas white; fruits splitting into 4 nutlets, these shallowly wrinkled or with blunt, rounded tubercles on the dorsal surface (the surface sometimes obscured by hairs). . . . . *H. europaeum*
            4. Leaf blades broadly ovate to oblong-ovate or triangular-ovate, the margins often somewhat scalloped, wavy, or coarsely toothed; corollas blue to purplish blue; fruits mostly splitting into 2 pairs of nutlets, these with longitudinal ridges on the dorsal surface. . . . *H. indicum*

European heliotrope was introduced into North America prior to the mid-19th century (Gray, 1870) but has not become a serious weed (Lorenzi and Jeffery, 1987), and has a widespread but highly fragmented range. Missouri represents the northwesternmost

Figure 2. State-level distribution of *Heliotropium europaeum* in temperate North America (adapted from USDA-NRCS [2007]) The Missouri occurrence is not mapped.

occurrence (Fig. 2), except for California, where the species occurs, and it has been documented previously in three adjacent states, Illinois, Arkansas, and Tennessee. The only record for the species in Illinois is from Cook County (Mohlenbrock and Ladd, 1978) and the species is represented in the Illinois State Museum database (http://www.museum.state.il.us/ismdepts/ herbarium/ botany/database.html) by a single collection made in 1949. The Arkansas records (Smith, 1988) come from three counties in the southern half of the state (Arkansas, Monroe, and Pike), and the western Tennessee counties of Shelby and Wayne are mapped in the Tennessee Vascular Plants database (http://tenn.bio.utk.edu/ vascular/vascular.html). It is not certain if this species is truly naturalized in Missouri or if the collection represents a recent introduction that may not spread. Collectors should be alert to the possible presence of *H. europaeum* in disturbed areas throughout the state. European heliotrope would not be a welcome addition to

the flora of the state if it were to become common. The plant is poisonous to a wide variety of domestic animals (Hill et al., 1997; Jones et al., 1981; Pass et al., 1979; Seaman, 1987) and is considered a nuisance in Australia, where it is an abundant introduced taxon (Auld and Medd, 1987).

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MELICA MUTICA (POACEAE) NEW FOR THE FLORA OF MISSOURI

Alan E. Brant
HC 64, Box 740
Glen Allen, MO 63751

Two populations of *Melica mutica* Walter (two-flowered melic grass) were first observed on 30 April 2008 in two adjacent, forested, southwest-facing tributaries of Marble Creek in Iron County, Missouri (Lake Killarney and Ironton Quadrangles). The plants were immature but had a different aspect from *Melica nitens* (Scribner) Nutt. ex Piper. The populations were encountered while conducting US Forest Service-funded botanical surveys in the Potosi/Fredricktown Ranger District for the Mark Twain National Forest. The sites were revisited on 9 May and 16 May 2008 and mature specimens were collected. All vouchers (immature — *Brant & O'Donnell 6452, 6454* and more mature — *Brant 6462, 6501*) are deposited at the Missouri Botanical Garden Herbarium (MO).

Melica mutica is a native North American species long known from the adjoining states of Arkansas, Iowa, and Illinois, even from counties bordering the state of Missouri (Yatskievych, 1999). It was expected that eventually it would be found in Missouri. The species is distributed from Iowa and Texas east to Maryland and Florida (Barkworth, 2007).

The following key may be used to distinguish the two species found in Missouri:

1. Rudiments (portion of the spikelet with underdeveloped, steirle florets) usually at an angle to the rachilla (central axis of the spikelet); glumes subequal in length; panicle relatively simple, often appearing racemose and narrow, the branches with 2–4(5) spikelets. . . . . *M. mutica*
1. Rudiments usually in line with the rachilla; glumes unequal in length; panicle usually compound, usually appearing well-branched and pyramidal in outline, the branches with (4)5–20 spikelets. . . . . *M. nitens*

The following description is adapted from the *Flora of North America* treatment (Barkworth, 2007) with modifications based on observations of newly collected Missouri specimens. The grass manuals of Gould (1975) and Hitchcock and Chase (1951) also were consulted.

***Melica mutica* Walter.** Culms cespitose, forming clumps, spreading-ascending to ca. 50–60 cm; rootstocks short, meagerly knotty, perennial, not forming corms; internodes scabridulous; sheaths scabridulous; ligules 0.5–1.7 mm long; blades 1.8–6.0 mm wide, adaxial surface puberulent, abaxial surface glabrous to scabridulous. Panicles 4–25 cm long; branches few (occasionally none), mostly basal, 3.5–6.0 cm long, appressed to spreading, straight, with 2–5 spikelets; pedicels sharply bent below the spikelets; disarticulation below the glumes. Spikelets 6–11 mm wide, with (1)2(4) bisexual flowers, floral apices within each spikelet at about the same level; rachilla internodes 1.5–1.7 mm. Lower glumes 4.5–8 mm long, 3–4 mm wide, 5–7-veined; upper glume 5–9 mm long, 2.5–3.5 mm wide, 5–6-veined; lemmas 6–11 mm long, glabrous or scabrous, indurate, prominently 9–11-veined, apices rounded to acute, unawned; paleas ca. ¾ the length of the lemmas; anthers 1–3 mm long; rudiments 2–3 mm long, club-like, not resembling the bisexual flowers, bent at a sharp angle to the rachilla in mature specimens.

The flowering period of *Melica mutica* in Texas is, March through May, whereas that of *Melica nitens* in Texas is April throughJune (Gould, 1975). This suggests that *M. mutica* flowers a little earlier than *M. nitens* in Texas, and this probably is the case in Missouri as well.

THE SETTING IN MISSOURI

The two sites where the plants occur are similar and best characterized as secondary open-canopy hardwoods with mesic to wet, rocky, alluvial soils in relatively wide, flat, small stream bottoms on predominantly igneous substrates. The plants seem to occur only in the alluvial soil of the bottoms; no plants were observed above the bases of the toe-slopes. In both small valleys the plants are thinly dispersed through the woods, not forming a turf, sometimes forming loosely defined patches. The tightly cespitose clumps have spreading-ascending culms. This gives the

appearance of loosely cespitose clumps, but when the duff is cleared from the base of a plant it becomes clear that many (not all) of the culms spread horizontally from the meager, knotty base of the plant and ascend through and under the duff. Plants growing in close proximity may appear to be connected, but are not. The description of *Melica mutica* in the Flora of North America (Barkworth, 2007) states that the plants are loosely cespitose or even shortly rhizomatous. This is not true for any of the MO vouchers.

The northern population (T33N R04E Sec. 17 SW¼ of NE¼) occurs in an area about 450 × 250 m. Plants were observed from the National Forest boundary (about 1035 ft elevation) up to about 1045 ft (320 m). At this site, hundreds of fertile clumps were observed growing in mesic alluvial soil. Associated herbaceous layer species include *Bromus pubescens, Carex retroflexa, C. planispicata, Cardamine concatenata, Delphinium tricorne, Festuca subverticillata, Luzula bulbosa, Poa sylvestris, Ranunculus harveyi*, and *Sphenopholis nitida*. Canopy and shrub layer species include *Acer saccharum, Carya ovata, Fraxinus pennsylvanica, Hamamelis virginiana, Juniperus virginiana, Quercus alba, Rhus aromatica, Symphoricarpos orbiculatus*, and *Ulmus rubra*. The floodplain obviously has been disturbed in the past, possibly pastured (probably not plowed) and probably logged repeatedly. Unfortunately, the private land below the Forest boundary has been converted to pasture and the permanent stream has been channelized.

The southern population (T33N R04E Sec. 20 NW¼ of NE¼) covers an area of about 500 × 250 m. Plants were observed from the National Forest boundary (about 1000 ft elevation) up to about 1020 feet (310 m). At this locality about 100–200 fertile clumps were observed growing in mesic-wet alluvial soil. Some plants were growing in saturated soil of a forested seep/spring branch. Most of the same species associated with the northern location occur here, except in the seep, where the plants occur with *Carex hystericina, C. leptalea, Glyceria striata, Packera aurea, Rosa setigera*, and *Rudbeckia fulgida*. Here the private land below the Forest boundary is cleared and mowed but with scattered trees and not grazed. An occupied house is within eyesight about 500 m below the boundary.

ACKNOWLEDGMENTS

Thanks go to Theo Witsell (Arkansas Natural Heritage Program) and George Yatskievych (Missouri Botanical Garden), who verified the determinations of the voucher specimens. The manuscript also was improved by the editing and helpful suggestions of John Pruski (Missouri Botanical Garden).

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SCHOENOPLECTUS CALIFORNICUS (CYPERACEAE) NEW TO MISSOURI

Timothy E. Vogt
Missouri Department of Natural Resources
Division of State Parks
1659 East Elm St., Jefferson City, MO 65101

Paul M. McKenzie
U.S. Fish and Wildlife Service
101 Park DeVille Dr.; Suite A
Columbia, MO 65203-0057

Schoenoplectus californicus (C.A. Meyer) Soják (giant or California bulrush) is a perennial species that occurs primarily along the Coastal Plain of North Carolina to Florida, west to Texas, Utah and California, and northward in the interior to Arkansas, Illinois, Kansas, Oklahoma, and Tennessee (Godfrey and Wooten, 1979; Mohlenbrock, 2001; Smith, 2002; NatureServe, 2008). Giant bulrush is primarily an aquatic species that inhabits fresh and brackish marshes and shallow water in pools, drainage canals and ditches (Godfrey and Wooten 1979; Mohlenbrock 2001; Smith 2002). The species was not recorded in Yatskievych (1999) and has not been reported previously in the floristic and taxonomic literature for Missouri. *Schoenoplectus californicus* is listed as S1 (critically imperiled) in Missouri (Missouri Department of Conservation, 2008) and as S1/S2 in Arkansas (NatureServe, 2008).

Scheonoplectus californicus was first discovered by Vogt on 26 September 2001 in Phelps County at DeWitt Pond (adjacent to Wilkins Spring) in the Mark Twain National Forest near Kaintuck Hollow, where a small population was observed near the outflow into Mill Creek. On 7 October 2001, Vogt discovered a new population in Reynolds County in a roadside ditch ca. 2 miles northwest of the small town of Reynolds along State Highway 72. On 10 July 2002 Vogt discovered another population in Phelps County at a small wildlife pond ca. 0.25 miles east-southeast of DeWitt Pond. A fourth locality for giant bulrush was discovered by the authors on 26 June 2008 in Dent County along the edge of a

farm pond east of State Highway 72 and ca. 5 mi. NW of Salem. All populations discovered form large nearly monocultural stands with stout culms that are 2.5 m to nearly 3.5 m tall.

In Missouri, *S. californicus* is likely only to be confused with *S. tabernaemontani* (C.C. Gmel.) Palla (softstem bulrush) or *S. acutus* (Muhl. ex Bigelow) Á. Löve & D. Löve (hardstem bulrush). Giant bulrush can be separated from these by the fewer perianth bristles (2–4 vs. 6) that are strap-like and fringed with soft, blunt, translucent teeth (Fig. 1). The perianth bristles on softstem and hardstem bulrush are spine-like bristles with conspicuous retrorse barbs that usually appear distinct, with space easily visible between the individual teeth (Diggs et al., 1999). In the perianth members of *S. californicus*, the teeth radiate in all directions and often overlap or are somewhat matted, with little or no space visible between individual teeth (see key in Diggs et al. 1999). When viewing achenes, observers should be careful not to confuse perianth bristles with the 2 or 3, often persistent, strap-like, fringless staminal filaments.

Schoenoplectus californicus and *S. acutus* can be distinguished from *S. tabernaemontani* by the dark or dull green culms. The culms of *S. tabernaemontani* are conspicuously blue green and often glaucous. Although Diggs et al. (1999) and Mohlenbrock (2001) reported that *S. californicus* can be distinguished from *S. tabernaemontani* by the more fibrillose basal sheaths, there apparently is overlap in this character; multiple authors have not acknowledged this field mark to separate the two species (e.g., Godfrey and Wooten, 1979; Smith, 2002). Despite the fact that there is overlap in the heights of *S. californicus, S. acutus,* and *S. tabernaemontani*, some culms of *S. californicus* can reach 4 m in length (Smith, 2002; pers. obs. of the authors; Fig. 2); this character may be useful in identifying the species in the field. Mohlenbrock (2001) stated that the achenes of *S. californicus* were smaller than those of *S. tabernaemontani*, but Godfrey and Wooten (1979) and Smith (2002) noted that there was overlap in achene measurements between the two species.

There is no evidence that giant bulrush was intentionally planted at any of the four localities in Missouri and it is likely that the species was introduced naturally by waterfowl, as speculated for various sedges elsewhere (deVlaming and Powers, 1968; Dunn and Knauer, 1975; Powers et al., 1978; McKenzie, 2000). Although

Mohlenbrock (2001) classified the sole locality for *S. californicus* in Illinois as being adventive, we believe that migrating waterfowl were also the likely introduction source for the species there. Due to its possible confusion with *S. acutus* and *S. tabernaemontani*, it is likely that *S. californicus* has been overlooked and that further searches in suitable habitat in Missouri will yield additional populations.

Voucher data (all specimens are accessioned at MO). **Dent County:** Farm pond along E side of of State Highway 72, ca. 0.9 mi S of bridge over Dry Fork Creek, ca. 1.3 mi. S of intersection with County Highway C, ca. 4 mi NW of Salem Memorial Hospital; T34N R6W S5 N¼ of W½, 26 June 2008, *McKenzie & Vogt 2343*. **Phelps County:** Mark Twain National Forest, DeWitt Pond (adjacent to Wilkins Spring), ca. 2 air mi S of junction of County Highway P on E side of County Highway AA; T36N R9W S 17 SW¼ of SW¼ of SE¼, 26 Sep 2001, *Vogt s.n.*; Mark Twain National Forest, small wildlife pond near DeWitt Pond, ca. 2 air mi south of junction of County Highway P on E side of County Highway AA; T36N R9W S20 NE¼, 10 July 2002. *Vogt 501*. **Reynolds County:** State Highway 72, ca. 2 mi NW of Reynolds, large colony in roadside ditch, T32N R2W S36 NE¼ of NE¼ of SE¼, 7 Oct 2001, *Vogt s.n.*

ACKNOWLEDGMENTS

We are grateful to George Yatskievych, Tim Smith, David Moore, and Theo Witsell for their assistance with this report.

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Figure 1. Ventral and dorsal views of achene of *S. californicus* (*McKenzie & Vogt 2343* [MO]). Note the perianth bristles with a matted fringe of hairs and the longer, smoother filaments of the stamens.

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PLANTS OF MISSOURI
Schoenoplectus caltfornicus (C. A. Mey.) Palla
Dent County: farm pond on east side of Rt. 72, ca. 0.9 mi south of Dry Fork Creek, or ca. 1.3 mi. south of the inter. of Rts. 72 and C, or ca. 4 mi. NW of the Salem Memorial Hospital; T34N, R6W, Sec. 5, N1/4 and W1/2; Salem 7.5' Quad; hundreds of culms along edges of pond: culms approaching 3.5 m tall; perianth bristles 2-3, soft, translucent and radiating in all directions with little space visible between individual teeth. First record for this county.
EXAMINED FOR THE FLORA OF MISSOURI PROJECT
Paul M. McKenzie 2343
with Tim Vogt
26 June 2008

Figure 2. Pressed specimen of *Schoenoplectus californicus*.

FLORA OF GALLOWAY CREEK NATURE PARK, HOWELL COUNTY, MISSOURI

Bill Summers
P.O. Box 912
West Plains, MO 65775

Galloway Creek Nature Park is located on the northwest side of the rapidly expanding urban area of West Plains, the county seat of Howell County, Missouri. The property is on the west side of County Road 1770, about midway between Girdley Street on the south, and Sunset Terrace on the north. The western boundary is the Burlington Northern Railroad right-of-way. The legal description is as follows. T24N R08W S08 E½ of NE¼ of SW¼. This nature park covers 37.5 acres. The land contained in this park was deeded to the City of West Plains in 1982 by Carl B. and Annis Bassler, in exchange for the sum of ten dollars and other valuable considerations, but was not dedicated officially as a city park until 2006. The park's intended purposes are for the preservation of its natural features and recreational use. The citizens of West Plains and surrounding area can be proud and thankful that the Basslers had foresight to let the city acquire this unique tract of land as a park for the use of the general public. It contains a number of interesting features, including: stream frontage along Galloway Creek; wetlands associated with springs, fens, and marshes; remnant upland prairie; and forests and woodlands

Galloway Creek is the same drainage as the North Fork of Howell Creek. A topographic map shows that at Girdley Street, the name Galloway changes to North Fork Howell Creek. Land elevations vary within the park. In the northwestern corner, near Sunset Terrace and the Burlington Northern Railroad, a bench marker shows the creek valley at 1019 feet, with the higher elevations along County Road 1770 at about 1040 feet.

Galloway Creek is the crown jewel of this park. It flows southward through the center of the property. Reptiles, amphibians, and fish are present in the stream waters. Muskrat and beaver also call this stream home. This stream has many side springs feeding into it, offering habitat for water cress and other cold water plants.

On the west side of the park, the area contains several acres of wetlands. These low areas are poorly drained. Previously, before channeling occurred, the various springs and spring branches flowed into the low areas, spreading out, creating the marshes and fens, before finding a course to flow into Galloway Creek. After channeling, the wetlands are mainly dry during the summer months and are dependent on local heavy rainfall to sustain them.

During the course of the plant survey (Appendix 1), it was found that the natural ecosystem is basically still intact, just waiting for a helping hand in restoration. The key native plants and animals are still present but human intrusion man has suppressed populations of many plants. There are still examples of many high-quality native plants, each growing in its preferred habitat of fen, marsh, swamp, wet creek margin, prairie, woods, and old fields. While conducting the survey, several animals were startled from their hiding places, including white-tailed deer, beavers, muskrats, rabbits, squirrels, chipmunks, snakes, quail, and other birds. In the wetlands and creek margins, frogs, snakes, and turtles, were observed, with fish in the beaver ponds and along the course of the running stream.

Humans have altered the landscape tremendously at Galloway Creek Nature Park. Efforts to convert it into usable farmland were perhaps the first modern impact. Starting at the railroad right-of-way, two spring branches were channeled to run directly to the creek. Then the creek was channeled to run straight, eliminating meanders. The channeling had a direct impact on the wetlands and springs, reducing their size and quality.

The best information available is that the farm was used primarily for livestock purposes. As the native vegetation decreased, fescue and other grasses were introduced to keep the farm's profitability up. As the land became more disturbed and degraded, exotic plant species started to invade. These exotics were kept to a minimum by grazing livestock and mowing. Once the farming practices were stopped, exotic species began to increase in such great numbers that thickets became dense enough that one could scarcely walk through them. However, native species also increased in numbers after farming was discontinued (see Appendix 1).

In the remnant prairie along the west park boundary, native prairie grasses, forbs, and shrubs are returning. Some of the prairie

indicator species observed were: big and little bluestem, Indian grass, longspike tridens, culver's root, prairie willow, sawtooth sunflower, ashy sunflower, and rosinweed.

In the swampy wetlands, native plant species such as New England aster, round-fruited St. John's-wort, common sneezeweed, purpletop sneezeweed, sedges, rushes, water horehound, monkey flower, willow, green ash, blue lobelia, peppermint, mad dog skullcap, smartweeds, water purslane, cat-tail, creamy violet, fowl meadow grass, and rice cutgrass may be found.

Fen species are fairly well represented. The following species were observed: bulrushes, mecardonia, spike rush, New England aster, white aster, willow-leaved aster, common sneezeweed, mud plantain, boneset, orange coneflower, sedges, groundnut, rushes, winged loosestrife, and yellow loosestrife.

Species of the wet creek margins, running water, beaver ponds, and pools include: elodea, sedges, umbrella sedges, hedgehog club rush, chairmaker's rush, bulrushes, blue lobelia, monkey flower, boneset, willow, water horehound, yellow ironweed, water purslane, floating primrose willow, pinkweed, smartweed, swamp dogwood, and leafy pondweed. There is good diversity among the native aquatic and semi-aquatic species occupying the wetlands.

A few species observed in the woods are redbud, sycamore, green ash, grape, spreading aster, blue wood aster, hawthorn, oak, hickory, black walnut, passion flower, sassafras, elm, poison ivy, honey locust, and hackberry.

Old field flora includes white heath aster, butterfly weed, common milkweed, thistles, goldenrods, black-eyed Susan, brown-eyed Susan, broomsedge, brome, beaked panic grass, dewberry, sumac, wisteria, tall thoroughwort, curly dock, ironweed, plum, hawthorns, Johnson grass, big bluestem, little blue stem, Indian grass, prairie dropseed, yellow ironweed, and white crownbeard.

During the course of the survey, 390 plant species were located in the various plant communities within the park boundaries. Of these, 289 species (74%) are considered native to the property. This is an encouragingly high number of native plant species for such a small tract of land. It shows the great diversity in the different plant habitats that are present. The remaining 101 species (26%) are not considered native at the site. Mostly, they are not native anywhere in Missouri.

During the the plant survey, it was found that Galloway Creek Nature Park harbors at least thirteen highly invasive plant species that warrant control or elimination where possible. These include autumn olive, Bradford pear, fescues, bush honeysuckle, Japanese honeysuckle, sericea lespedeza, crown vetch, spotted knapweed, wintercreeper, multiflora rose, and Himalayan blackberry. Seven additional exotic species at the nature park bear watching, and control practices should be put in place where needed. Such plants include; musk thistle, Johnson grass, white and yellow sweet clovers, burning bush, blunt-leaved privet, and poison hemlock.

With restoration efforts to decrease the invasion of exotic species, the native species should make a dramatic comeback. As one looks around the nature park, one can see already where inroads have been made to eliminate the exotic plants. Many individuals and organizations have come together to work as a team to eradicate these unwanted plants. In addition to efforts to eliminate undesirable exotic plants, there have been projects to transplant desirable species into various parts of the property, particularly along the creek to stabilize stream bank erosion. Species such as cane, sycamore, bald cypress, pin oak, and river birch have been added to the existing flora of the park.. The various civic organizations and individuals involved in these efforts are to be complimented for their efforts.

CONSTRUCTED HABITATS

In addition to the plants inventoried and listed as occurring naturally in the nature park, several other plants that are native to the area have been planted in wildflower gardens to enhance the park's aesthetic beauty. Cindy Craig, along with other individuals, constructed a Butterfly Garden beside the path to the covered bridge. Due to her thoughtfulness, many will be able to enjoy the beautiful and colorful butterflies and wildflowers. Some of the wildflowers planted in the garden are; blue indigo, wild bergamot, New England aster, white beardtongue, black-eyed Susan, prairie blazing star, rigid goldenrod, garden phlox, meadow phlox, sweet William, copper iris, river oats, red buckeye, little bluestem, and Indian paintbrush.

David Evans is to be complimented for his efforts in constructing a glade habitat around the Galloway Creek Nature

Park sign post. This was a Boy Scouts of America project to earn his Eagle Scout Award. The raised mound of dirt, with its gentle slope, will offer a terrace of beauty when the native glade flowers are in bloom. Glade-loving native plants such as purple beard tongue, lance-leaved coreopsis, Missouri primrose, purple poppy mallow, rattlesnake master, agave, blazing star, rock pink, pale purple coneflower, and yellow coneflower were planted.

Rain garden flower beds have been constructed along the lower, west side of the paved parking lot. The lower side of these gardens has been raised by placing a low wall of flat rocks along the adjacent path. Fill-dirt was then added to bring the flower beds to the same level with the paved edge of the parking area. These flower beds are designed to catch run-off water from the parking lot and will mimic marsh and wetland habitats. So far, beauty berry, false indigo, buttonbush, witch hazel, and other shrubs have been planted in this area. Trent Courtney, with assistance from others, constructed another rain garden on the northwest corner. It has been his Eagle Scout Project, and is still ongoing at the time of this writing; the plants have not yet been set out.

An area in the southeast corner of the nature park has been been the site of a tallgrass prairie planting. Species such as big and little blue stem, Indian grass, and prairie dropseed have been planted, along with some forbs such as purple milkweed, ironweed, and blue sage. Those involved in this prairie restoration project have done a magnificent job.

CONCERNS

The dry reservoir of about one acre is an ugly scar on the face of the nature park. There are no springs or seeps to sustain permanent water and keep the basin filled. It is merely a depression on a dry hillside. A deep ditch has been cut from the reservoir to the nearby roadside ditch. During heavy rains, water backs up from the roadsdie ditch and silt (mud, sand, gravel and rocks) is deposited in the basin. The bottom of the reservoir is gradually filling with this unsightly debris. The only plants found inside the basin are willow, barnyard grass, smartweed, and cocklebur. Perhaps a solution would be to bulldoze the berm back into the basin and bring the level back up to that of the natural terrain, then

to extend the adjacent prairie restoration project southward to cover it.

The running stream and pools are clogged in places with thick stands of algae from pollution sources up-stream. These have a tremendous negative impact on other aquatic species. This situation should be remedied.

Since the notice appeared in the local newspaper recently about work to be done on County Road 1770, there are those who have voiced concerns about the large trees along the roadway bordering the park. It seems the roadside row of black walnut trees is admired by a lot of people who drive the road and would prefer that these trees not be damaged or removed.

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Appendix 1. Checklist of vascular plant species at Galloway Creek Nature Park, West Plains, Missouri. Plants listed are from field surveys conducted during 2007. Several field trips, primarily from late April to November, were made to the nature park for field work. Plants are listed alphabetically by family, then genus and species. Asterisks indicatee species that are not considered native at the site, but a few of these introduced taxa are native elsewhere in Missouri. Nomenclature generally follows that of Yatskievych (1999, 2006) for species in families included in those volumes, and Yatskievych and Turner (1990) for species in other families.

ACANTHACEAE, Acanthus Family
Ruellia humilis Nutt., wild petunia
Ruellia strepens L., wild petunia, smooth ruellia

ACERACEAE, Maple Family
Acer negundo L., box elder, ash-leaved maple
Acer saccharinum L., silver maple, soft maple

ACORACEAE, Arum Family
**Acorus calamus* L., sweet flag, calamus

ALISMATACEAE, Water Plantain Family
Alisma triviale Pursh, northern water plantain

AMARANTHACEAE, Amaranth Family
**Amaranthus hybridus* L., green amaranth, slender pigweed
**Amaranthus spinosus* L., careless weed, spiny pigweed, thorny amaranth
Amaranthus tuberculatus (Moq.) J. Sauer, water hemp

ANACARDIACEAE, Cashew Family
Rhus aromatica Aiton, fragrant sumac, polecat bush
Rhus copallinum L., dwarf sumac, winged sumac
Rhus glabra L., smooth sumac
Toxicodendron radicans (L.) Kuntze, poison ivy

APIACEAE (UMBELLIFERAE), Carrot Family
Chaerophyllum procumbens (L.) Crantz, wild chervil
Cicuta maculata L., common water hemlock, spotted cowbane
**Conium maculatum* L., poison hemlock
**Daucus carota* L. ssp. *carota*, Queen Ann's lace, wild carrot
**Torilis arvensis* (Huds.) Link, field hedge parsley

APOCYNACEAE, Dogbane Family
Apocynum cannabinum L., Indian hemp, prairie dogbane

AQUIFOLIACEAE, Holly Family
Ilex decidua Walter, deciduous holly, possum haw

ASCLEPIADACEAE, Milkweed Family
Asclepias hirtella (Pennell) Woodson, prairie milkweed, tall green milkweed
Asclepias incarnata L. ssp. *incarnata*, swamp milkweed
Asclepias purpurascens L., purple milkweed
Asclepias syracia L., common milkweed
Asclepias tuberosa L. ssp. *interior* Woodson, butterfly weed
Asclepias viridiflora Raf., green milkweed

ASTERACEAE (COMPOSITAE), Sunflower Family
Achillea millefolium L., yarrow, milfoil.
Ambrosia artemisiifolia L., common ragweed
Ambrosia bidentata Michx., lance leaf ragweed, southern ragweed
Ambrosia trifida L., giant ragweed
**Arctium minus* (Hill) Bernh., burdock
**Artemisia annua* L., annual wormwood, sweet sagewort, sweet wormwood
Bidens aristosa (Michx.) Britton, tickseed sunflower, beggar ticks
Bidens frondosa L., begger-ticks, sticktights
**Carduus nutans* L., musk thistle, nodding thistle
**Centaurea stoebe* L. ssp. *micranthos* (S.G. Gmel. ex Gugler) Hayek, spotted knapweed
Cirsium altissima (L.) Spreng., Tall thistle, roadside thistle
Cirsium discolor (Muhl. ex Willd.) Spreng., field thistle
**Cirsium vulgare* (Savi) Ten., bull thistle
**Cichorium intybus* L., chicory, blue sailors
Conyza canadensis (L.) Cronquist, Canada fleabane, hog weed, horse weed, mule tail weed
Eclipta prostrata (L.) L., Yerba de Tajo
Erechtites hieracifolius (L.) Raf. ex DC. var. *hieracifolius*, fireweed
Erigeron strigosus Muhl. ex Willd., daisy fleabane, whitetop fleabane
Eupatorium altissimum L., tall thoroughwort
Eupatorium perfoliatum L. var. *perfoliatum*, boneset, thoroughwort
Eupatorium serotinum Michx., late boneset.
Helenium amarum (Raf.) H. Rock var. *amarum*, bitterweed, bitter sneezeweed, yellow dog fennel, Arkansas dog fennel.
Helenium autumnale L., common sneezeweed, autumn sneezeweed.
Helenium flexuosum Raf., purple-headed sneezeweed, southern sneezeweed.
Helianthus grosseserratus M. Martens, sawtooth sunflower
Helianthus hirsutus Raf. hairy sunflower, bristly sunflower, woodland sunflower
Helianthus mollis Lam., ashy sunflower
Helianthus tuberosus L. Jerusalem artichoke
Heterotheca camporum (Greene) Shinners, golden aster, camphor weed
Iva annua L., marsh elder, sump weed
Lactuca canadensis L., wild lettuce
Lactuca floridana (L.) Gaertn., Florida lettuce, woodland lettuce
**Lactuca saligna* L., willow-leaved lettuce

**Lactuca serriola* L., prickly lettuce
**Leucanthemum vulgare* Lam., ox-eye daisy, white daisy, field daisy
**Matricaria discoidea* DC. pineapple weed
Rudbeckia fulgida Aiton, orange coneflower, marsh coneflower
Rudbeckia hirta L. var. *pulcherrima* Farw., black-eyed Susan
Rudbeckia subtomentosa Pursh, sweet coneflower
Rudbeckia triloba L. var. *triloba*, brown-eyed Susan
Silphium asteriscus L. var. *asteriscus*, starry rosinweed
Silphium integrifolium Michx., rosinweed
Solidago altissima L., tall goldenrod
Solidago petiolaris Aiton, downy goldenrod
**Sonchus asper* (L.) Hill ssp.*asper*, prickly sow thistle, spiny-leaved sow thistle
Symphyotrichum cordifolium (L.) G.L. Nesum, blue wood aster
Symphyotrichum dumosum (L.) G.L. Nesom var. *strictior* (Torr. & A. Gray) G.L. Nesom, tradescant aster
Symphyotrichum lanceolatum (Willd.) G.L. Nesom, tall white aster, panicle aster
Symphyotrichum lateriflorum (L.) A. Love & D. Love, White woodland aster
Symphyotrichum novae-angliae (L.) G.L. Nesom, New England aster
Symphyotrichum ontarionis (Wiegand) G.L. Nesom, Ontario aster
Symphyotrichum parviceps (Burgess) G.L. Nelsom, small white aster
Symphyotrichum patens (Aiton) G.L. Nesom, spreading aster, purple daisy
Symphyotrichum pilosum (Willd.) G.L. Nesom, white heath aster
Symphyotrichum praealtum (Poir.) G.L. Nesom, willow-leaved aster
**Taraxacum erythrospermum* Andrz. ex Besser, red-seeded dandelion
**Taraxacum officinale* F.H. Wigg., common dandelion
Verbesina alternifolia (L.) Britton ex Kearney, yellow ironweed
Verbesina virginica L. var. *virginica*, white crown beard, frostweed
Vernonia arkansana DC., Arkansas ironweed
Vernonia baldwinii Torr., western ironweed
Xanthium strumarium L., common cocklebur

BALSAMINACEAE, Touch-Me-Not Family
Impatiens capensis Meerb., jewelweed, spotted touch-me-not

BETULACEAE, Birch Family
Betula nigra L. river birch
Corylus americana Walter., hazelnut

BIGNONIACEAE, Trumpet Creeper Family
Campsis radicans (L.) Seem., trumpet creeper, trumpet vine
Catalpa speciosa Warder ex Engelm., northern catalpa, cigar tree

BORAGINACEAE, Borage Family
**Buglossoides arvense* (L.) I.M. Johnst., corn gromwell

BRASSICACEAE (CRUCIFERAE), Mustard Family
**Barbarea vulgaris* R. Br., yellow rocket, winter cress

**Capsella bursa-pastoris* (L.) Medik., shepherd's purse
Cardamine bulbosa (Schreb. ex Muhl.) Britton, Sterns & Poggenb., spring cress
**Lepidium campestre* (L.) R. Br., field cress, cow cress, field pepper grass
Lepidium virginicum L., pepper grass
**Nasturium officinale* R. Br., water cress

CALLITRICHACEAE, Water Starwort Family
Callitriche heterophylla Pursh var. *heterophylla*, large water starwort

CAMPANULACEAE, Bellflower Family
Lobelia inflata L., Indian tobacco
Lobelia inflata siphilitica L., Blue lobelia, blue cardinal flower

CAPRIFOLIACEAE, Honeysuckle Family
**Lonicera japonica* Thunb. ex Murray, Japanese honeysuckle
**Lonicera maackii* (Rupr.) Maxim., Amur honeysuckle, bush honeysuckle
Sambucus canadensis L., elderberry
Symphoricarpos orbiculatus Moench., coral berry, buckbrush
Viburnum rufidulum Raf., southern blackhaw, wild raisin

CARYOPHYLLACEAE, Pink Family
**Arenaria serpyllifolia* L., slender sandwort
**Cerastium arvense* L. ssp. *strictium* Gaudin, field chickweed
**Cerastium fontanum* Baumg. ssp. *vulgare* (Hartman) Greuter & Burdet, mouse-eared chickweed
**Dianthus armeria* L. ssp. *armeria*, Deptford pink
Silene stellata (L.) W.T. Aiton, starry campion
**Stellaria media* (L.) Vill., common chickweed

CELASTRACEAE, Staff-Tree Family
**Euonymus alatus* (Thunb.) Siebold, burning bush, winged euonymus
**Euonymus fortunei* (Turcz.) Hand.-Mazz., winter creeper

CHENOPODIACEAE, Goosefoot Family
**Chenopodium album* L., lamb's quarter, pigweed
**Chenopodium ambrosioides* L., Mexican tea, wormwood

CLUSIACEAE (GUTTIFERAE), St. John's Wort Family
Hypericum shaerocarpum Michx., round-fruited St. John's wort

CONVOLVULACEAE, Morning Glory Family
**Convolvulus arvensis* L., field binderweed
**Ipomoea hederacea* Jacq., blue morning glory
Ipomoea pandurata (L.) G. Mey., wild potato vine, man-of-the-earth, bigfoot morning glory

CORNACEAE, Dogwood Family
Cornus amomum Mill. ssp. *obliqua* (Raf.) J.S. Wilson, swamp dogwood
Cornus drummondii C.A. Mey., rough-leaved dogwood

Cornus foemina Mill., gray dogwood, stiff dogwood

CUPRESSACEAE, Cypress Family
Juniperus virginiana L. var. *virginiana*, red cedar
**Taxodium distichum* (L.) Rich. var. *distichum*, bald cypress

CYPERACEAE, Sedge Family
Carex amphibola Steud.
Carex annectens (E.P. Bicknell) E.P. Bicknell
Carex austrina (Small) Mack.
Carex blanda Dewey
Carex bushii Mack.
Carex cephalophora Muhl. ex Willd.
Carex frankii Kunth
Carex glaucodea Tuck.
Carex granularis Muhl. ex Willd.
Carex grisea Wahlenb.
Carex lurida Wahlenb.
Carex molesta Mack.
Carex muehlenbergii Schkuhr. ex Willd.
Carex normalis Mack.
Carex pellita Muhl. ex Willd.
Carex shortiana Dewey
Carex vulpinoidea Michx., fox sedge
Cyperus acuminatus Torr. & Hook., umbrella sedge
Cyperus echinatus (L.) A.W. Wood, hedgehog club rush
Cyperus erythrorhizos Muhl., redroot flat sedge, nutgrass
Cyperus strigosus L., false nutgrass, umbrella sedge
Eleocharis erythropoda Steud., spike rush
Schoenoplectus pungens (Vahl) Palla var. *pungens*, chairmaker's rush
Scirpus atrovirens Willd., common bulrush
Scirpus pendulus Muhl. ex Elliott

EBENACEAE, Ebony Family
Diospyros virginiana L. persimmon, possum wood

ELAEAGNACEAE, Oleaster Family
**Elaeagnus umbellata* Thunb., autumn olive

EUPHORBIACEAE, Spurge Family
Acalypha rhomboidea Raf., three-seeded mercury
Acalypha virginica L., Virginia copperleaf
Croton capitatus Michx., woolly croton
Croton monanthogynus Michx., one-seeded croton, prairie tea
Euphorbia dentata Michx., toothed spurge
Euphorbia maculata L., milk purslane, prostrate spurge,
Euphorbia nutans Lag., nodding spurge

FABACEAE (LEGUMINOSAE) Bean Family
Amorpha fruticosa L., false indigo

Amphicarpaea bracteata (L.) Fernald, hog peanut
Apios americana Medikus, groundnut, potato bean
Baptisia alba (L.) Vent. var. *macrophylla* (Larisey) Isely, white wild indigo
Cercis canadensis L. var. *canadensis*, red bud, Judas tree
Chamaecrista fasciculata (Michx.) Greene, showy partridge pea, sensitive pea
Chamaecrista nictitans L., small-flowered partridge pea, sensitive pea
Desmodium canescens (L.) DC., hoary tick clover
Desmodium ciliare (Muhl. ex Willd) DC., slender tick clover
Desmodium cuspidatum (Muhl. ex Willd.) Loudon, longleaf tick clover
Desmodium laevigatum (Nutt.) DC., smooth tick clover
Desmodium marilandicum (L.) DC., Maryland tick clover
Desmodium paniculatum (L.) DC., tick trefoil
Desmodium perlexum B.G. Schub., tick trefoil
Gleditsia triacanthos L., honey locust, thorn tree
**Kummerowia stipulacea* (Maxim.) Makino, Korean clover, Korean lespedeza
**Kummerowia striata* (Thunb.) Schindler, Japanese lespedeza, common lespedeza
**Lathyrus latifolius* L., everlasting pea, sweet pea
**Lespedeza cuneata* (Dum.-Cours.) Don, sericea lespedeza
Lespedeza procumbens Michx., trailing bush clover, trailing lespedeza
Lespedeza violacea (L.) Pers., prairie bush clover, prairie lespedeza
Lespedeza virginica (L.) Britton, slender bush clover, slender lespedeza
**Melilotus albus* Medikus, white sweet clover
**Melilotus officinale* (L.) Pallas, yellow sweet clover
Mimosa quadrivalvis L. var. *nuttallii* (DC. ex Britton & Rose) Beard ex Barneby, sensitive brier, catclaw sensitive brier
**Securigera vara* (L.) Lassen, crown vetch
Senna marilandica (L.) Link, wild senna
Strophostyles helvola (L.) Elliott, wild bean
Strophostyles leiosperma (Torr. & A. Gray) Piper, slickseed wild bean
Stylosanthes biflora (L.) Britton, Sterns & Pogg., pencil flower
**Trifolium campestre* Schreb., large hop clover, yellow hop clover
**Trifolium dubium* Sibth., little hop clover, yellow hop clover
**Trifolium pratense* L., red clover
**Trifolium repens* L., white clover
**Vicia sativa* L. ssp. *nigra* (L.) Ehrh., common vetch, spring vetch
Wisteria frutescens (L.) Poiret, wisteria

FAGACEAE, Oak Family
Quercus alba L., white oak
Quercus imbricaria Michx., shingle oak
Quercus marilandica Muenchh., black jack oak
Quercus palustris Muenchh., pin oak
Quercus rubra L. var. *rubra*, red oak, northern red oak
Quercus stellata Wangenh., post oak
Quercus velutina Lam., black oak, yellow bark oak

GENTIANACEAE, Gentian Family
Sabatia angularis (L.) Pursh, rose pink, rose gentian

GERANIACEAE, Geranium Family
Geranium carolinianum L., Carolina cranesbill
**Geranium molle* L., dove's foot cranesbill

GROSSULARIACEAE, Currant Family
Ribes missouriense Nutt. ex Torr. & A. Gray, wild gooseberry

HYDROCHARITACEAE, Frogbit Family
Eleodea nuttallii Michx., eleodea, waterweed, bassweed

IRIDACEAE, Iris Family
Iris germanica L. blue flag, German iris
Sisyrinchium angustifolium Mill., blue-eyed grass

JUGLANDACEAE, Walnut Family
Carya cordiformis (Wangenh.) K. Koch, bitternut hickory, pignut hickory
Carya texana Buckley, black hickory, Ozark pignut hickory
Carya tomentosa (Poir.) Nutt., mockernut hickory, white hickory
Juglans nigra L., black walnut

JUNCAEAE, Rush Family
Juncus acuminatus Michx., knotty-leaved rush
Juncus biflorus Elliott, large grass-leaved rush
Juncus dudleyi Wiegand, rush
Juncus tenuis Willd., path rush
Juncus torreyi Cov., Torrey's rush

LAMIACEAE, Mint Family
**Lamium amplexicaule* L., henbit
**L. purpureum* L., dead nettle
Lycopus americanus Muhl. ex W.P.C. Barton, American bugleweed
Lycopus virginicus L., bugleweed
**Mentha ×piperita* L., spearmint
Prunella vulgaris L. var. *lanceolata* (W.P.C. Barton) Fernald, self-heal, heal-all
Pycnanthemum tenuifolium Schrader, slender mountain mint
Pycnanthemum virginianum (L.) Durand & Jackson, mountain mint
Salvia azurea Lam. var. *grandiflora* Benth., blue sage
Scutellaria lateriflora L., mad dog skullcap
Teucrium canadense L., wood sage, American germander

LAURACEAE, Avocado Family
Sassafras albidum (Nutt.) Nees, sassafras

LILIACEAE, Lily Family
**Allium vineale* L., field garlic
**Asparagus officinalis* L. ssp. *officinalis*, asparagus
**Hemerocaullis fulva* (L.) L., orange day lily

LYTHRACEAE, Toothcup Family
Lythrum alatum Pursh, winged loosestrife

MALVACEAE, Mallow Family
**Hibiscus trionum* L., flower-of-the-hour
**Sida spinosa* L., prickly sida

MOLLUGINACEAE, Carpetweed Family
**Mollugo verticillata* L., carpetweed

MORACEAE, Mulberry Family
**Maclura pomifera* (Raf.) C.K. Schneid., Osage orange, hedge apple, bois d'arc
**Morus alba* L., white mulberry, silkworm mulberry
Morus rubra L., red mulberry

OLEACEAE, Olive Family
Fraxinus americana L., white ash
Fraxinus pennsylvanica Marshall, green ash, red ash
**Ligustrum obtusifolium* Sieb. & Zucc., blunt-leaved privet

ONAGRACEAE, Evening Primrose Family
Gaura longiflora Spach, large-flowered gaura
Ludwigia alternifolia L., seedbox
Ludwigia palustris (L.) Elliott, water purslane
Ludwigia peploides (Kunth) P.H. Raven ssp. *glabrescens* (Kuntze) P.H. Raven, floating primrose willow, creeping primrose willow
Oenothera biennis L., common evening primrose
Oenothera laciniata Hill, cut-leaved evening primrose

OXALIDACEAE, Wood Sorrel Family
Oxalis fontana Bunge, yellow wood sorrel
Oxalis stricta L., yellow wood sorrel

PASSIFLORACEAE, Passion-Flower Family
Passiflora incarnata L., passion flower, maypops
Passiflora lutea L. var. *glabriflora* Fernald, yellow passion flower

PHYTOLACCACEAE, Pokeweed Family
Phytolacca americana L., pokeweed, poke

PINACEAE, Pine Family
**Pinus echinata* Mill., short-leaf pine

PLANTAGINACEAE, Plantain Family
**Plantago lanceolata* L., English plantain
Plantago rugelii Decne., Rugel's plantain, broad-leaved plantain
Plantago virginica L., hoary plantain

PLATANACEAE, Plane Tree Family
Platanus occidentalis L., sycamore

POACEAE (GRAMINEAE), Grass Family
**Agrostis gigantea* Roth, redtop
Andropogon gerardii Vitman, big blue stem, turkey foot
Andropogon virginicus L., broomsedge
Arundinaria gigantea (Walter) Muhl., giant cane
**Bromus inermis* Leyss., smooth brome, Hungarian brome
**Bromus japonicus* Thunb., Japanese brome, Japanese chess
**Bromus sterilis* L., barren brome
**Bromus tectorum* L., cheat grass, downy chess, downy brome
**Buchloe dactyloides* (Nutt.) Engelm., buffaloe grass
Chasmanthium latifolium (Michx.) H.O. Yates, river oats, wild oats
**Cynodon dactylon* (L.) Pers., Bermuda grass
**Dactylis glomerata* L., orchard grass
**Digitaria ciliaris* (Retz.) Koeler, crab grass
**Digitaria ischaemum* (Schreb.) Schreb. ex Muhl., smooth crab grass
**Digitaria sanguinalis* (L.) Scop., crab grass
**Echinochloa crusgalli* (L.) P. Beauv., barnyard grass
**Eleusine indica* (L.) Gaertn., ssp. indica goose grass, yard grass
Elymus canadensis L. var. *canadensis*, Canada wild rye
Elymus virginicus L., Virginia wild rye
Eragrostis cilianensis (All.) Vignolo ex Janch., stink grass
Eragrostis hypnoides (Lam.) Britton Sterns & Poggenb., creeping love grass, pony grass
Eragrostis spectabilis (Pursh) Steud., purple love grass
**Festuca arundinacea* Schreb., tall fescue
**Festuca pratensis* Huds., meadow fescue
Glyceria striata (Lam.) Hitchc., fowl manna grass, fowl meadow grass
**Hordeum pusillum* Nutt., little barley
Leersia oryzoides (L.) Sw., rice cutgrass
Leersia virginica Willd., white grass
**Lolium perenne* L., perennial rye grass
Muhlenbergia sylvatica (Torr.) Torr., forest muhly grass
Panicum acuminatum Sw. var. *acuminatum*
Panicum anceps Michx. var. *anceps*, beaked panic grass
Panicum clandestinum L.
Panicum dichotomiflorum Michx., tall panic grass
Panicum rigidulum Bosc ex Nees, redtop panic grass
Panicum virgatum L., switch grass
Paspalum floridanum Michx., Florida paspalum
Paspalum laeve Michx., field paspalum
**Phleum pratense* L., Timothy
**Poa annua* L., annual blue grass
**Poa compressa* L., Canada blue grass
Schizachyrium scoparium (Michx.) Nash var. *scoparium*, little bluestem
**Setaria faberi* R.A.W. Herrm., nodding foxtail, Chinese foxtail
**Setaria glauca* (L.) P. Beauv., yellow foxtail.
**Setaria italica* (L.) P. Beauv., common millet, foxtail millet

S. parviflora (Poir.) Kerguelen, yellow foxtail, knot root foxtail
Sorghastrum nutans (L.) Nash, Indian grass
**Sorghum halepense* (L.) Pers., Johnson grass
Sporobolus clandestinus (Biehler) Hitchc.
Sporobolus compositus (Poir.) Merr., rough dropseed, flag grass
Sporobolus vaginiflorus (Torr. ex A. Gray) A.W. Wood, poverty grass
Tridens flavus (L.) Hitchc., purple top, tall redtop
Tridens strictus (Nutt.) Nash., longspike tridens

POLYGONACEAE, Smartweed Family
**Polygonum aviculare* L., knotweed
Polygonum hydropiper L., smartweed, water pepper
Polygonum hydropiperoides Michx., wild water pepper
Polygonum lapathifolium L., pale smartweed
Polygonum pensylvanicum L., pinkweed, common smartweed
**Polygonum persecaria* L., lady's thumb, smartweed
Polygonum scandens L., false buckwheat
**Rumex crispus* L., curly dock, sour dock, yellow dock
**Rumex obtusifolius* L., bitter dock, broad-leaved dock

POTAMOGETONACEAE, Pondweed Family
Potamogeton foliosus Raf. var. *foliosus*, leafy pondweed

PRIMULACEAE, Primrose Family
Lysimachia quadriflora Sims, loosestrife

RANUNCULACEAE, Buttercup Family
Ranunculus abortivus L., small-flowered crowfoot, early wood buttercup
**Ranunculus sardosus* Crantz, buttercup

ROSACEAE, Rose Family
Agrimonia parviflora Aiton, swamp agrimony, many-flowered agrimony
Crataegus collina Chapm.
Crataegus crus-galli L. var. *crus-galli*, cockspur thorn
Crataegus engelmannii Sarg., barberry-leaved hawthorn
Crataegus neobushii Sarg., thicket hawthorn
Crataegus phaenopyrum (L.f.) Medik, Washington thorn
Crataegus uniflora Muenchh., dwarf hawthorn, one-flowered hawthorn
Crataegus viridis L., green hawthorn
Fragaria virginiana Duchesne, wild strawberry
Geum canadense Jacq., white avens
Potentilla simplex Michx., common cinquefoil, old field cinquefoil, five-finger cinquefoil
**Prunus mahaleb* L., perfumed cherry
Prunus mexicana S. Watson, big tree plum, wild plum
Prunus munsoniana Wight & Hedr., wild goose plum
Prunus serotina Ehrh. ssp. *serotina*, black cherry, wild cherry
**Pyrus calleryana* Decne., Bradford pear
Rosa carolina L., pasture rose
**Rosa multiflora* Thunb. ex Murray, multiflora rose, Japanese rose

Rosa setigera Michx., prairie rose, climbing rose
**Rubus armeniacus* Weihe & Nees, Himalaya berry
Rubus ensleuii Tratt., southern dewberry
Rubus flagellaris Willd., dewberry, northern dewberry
Rubus occidentalis L., black raspberry
Rubus pensilvanicus Poir., high bush blackberry

RUBIACEAE, Madder Family
Cephalanthus occidentalis L., buttonbush, globe flower, honey ball
Diodia teres Walter, rough buttonweed.
Diodia virginiana L., large buttonweed
Galium aparine L., cleavers, catchweed bedstraw
Galium concinnum Torr. ex A. Gray, shining bedstraw
**Galium pedemontanum* (Bellardi) All., Piedmont bedstraw
Galium tinctorium L., stiff bedstraw
Spermacoce glabra Michx., smooth buttonweed

SALICACEAE, Willow Family
Populus deltoides Bartram ex Marshall, cottonwood
Salix eriocephala Michx., diamond willow, Missouri willow
Salix exigua Nutt., sandbar willow, coyote willow
Salix humilis Marshall, prairie willow, dwarf gray willow
Salix nigra Marshall, black willow

SANTALACEAE, Sandalwood Family
Comandra umbellata (L.) Nutt., ssp. *umbellata*, bastard toadflax

SAXIFRAGACEAE, Saxifrage Family
Penthorum sedoides L., ditch stonecrop

SCROPHULARIACEAE, Figwort Family
Leucospora multiflora (Michx.) Nutt., conobea
Mecardonia acuminata (Walter) Small, mecardonia, water hyssop
Mimulus ringens L., Allegheny monkey flower
Penstemon digitalis Nutt. ex Sims, smooth beard-tongue
**Verbascum blattaria* L., moth mullein
**Verbascum thapsus* L., mullein, flannel plant
Veronica peregrina L., neck weed, purslane speedwell
Veronicastrum virginicum (L.) Farw., culver's root

SMILACACEAE, Greenbrier Family
Smilax hispida Muhl. ex Torr., bristly greenbrier, catbrier

SOLANACEAE, Nightshade Family
Physalis heterophylla Nees, clammy ground cherry.
Physalis virginiana Mill. var. *virginiana*, Virginia ground cherry
Solanum carolinense L., horse nettle, bull nettle
Solanum ptycanthum Dunal ex DC., black nightshade

TYPHACEAE, Cattail Family
Typha latifolia L., common cattail

ULMACEAE, Elm Family
Celtis tenuifolia Nutt., dwarf hackberry
Ulmus americana L., American elm
Ulmus rubra Muhl., slippery elm

URTICACEAE, Nettle Family
Urtica dioica L., tall nettle

VALERIANACEAE, Valerian Family
Valerianella radiata (L.) Dufr., corn salad, lamb's lettuce

VERBENACEAE, Vervain Family
Verbena urticifolia L., white vervain, nettle-leaved vervain

VIOLACEAE, Violet Family
Viola rafinesquii Greene, field pansy, wild pansy, Johnny-jump-up
Viola missouriensis Greene, Missouri violet
Viola sororia Willd., common violet, meadow violet, butterfly violet
Viola striata Aiton, pale violet, cream violet

VITACEAE, Grape Family
Parthenocissus quinquefolia (L.) Planch., Virginia creeper
Vitis aestivalis Michx. var. *aestivalis*, summer grape, pigeon grape
Vitis cinerea (Engelm.) Engelm. ex Millardet var. *cinerea*, graybark grape, sweet winter grape, pigeon grape